

HJS Emission Technology GmbH & Co. KG
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Underground Mining: Reduction of PM and NO_x by SMF Technologies of HJS / T.F. Hudgins

Mike Mazzuca, T.F. Hudgins Inc.

Peter Neumann, HJS Emission Technology



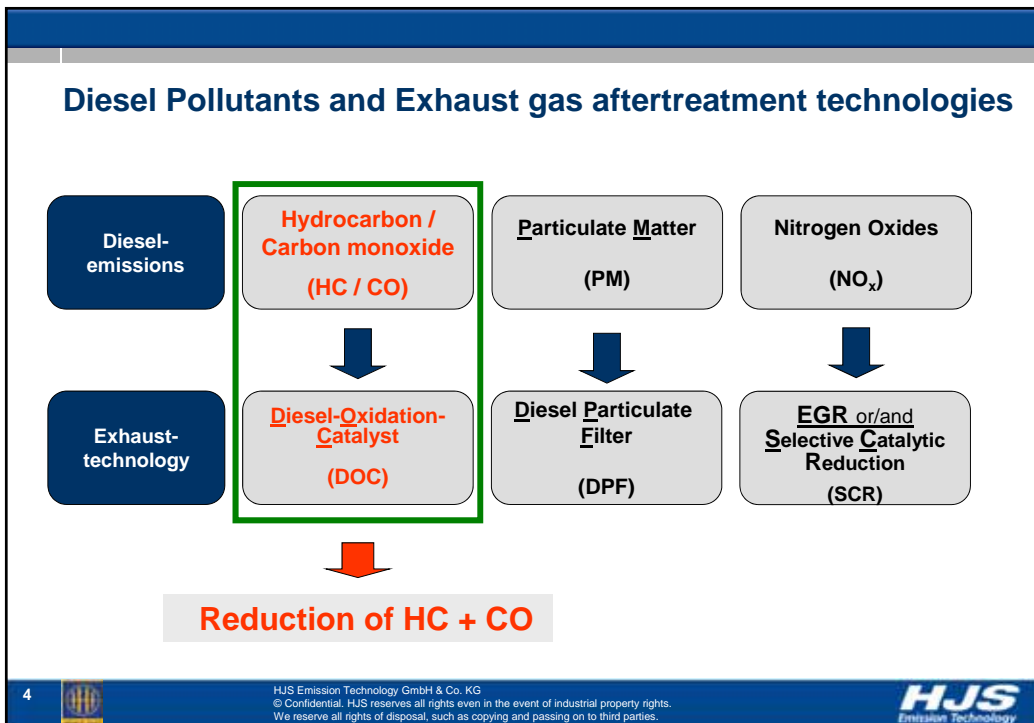
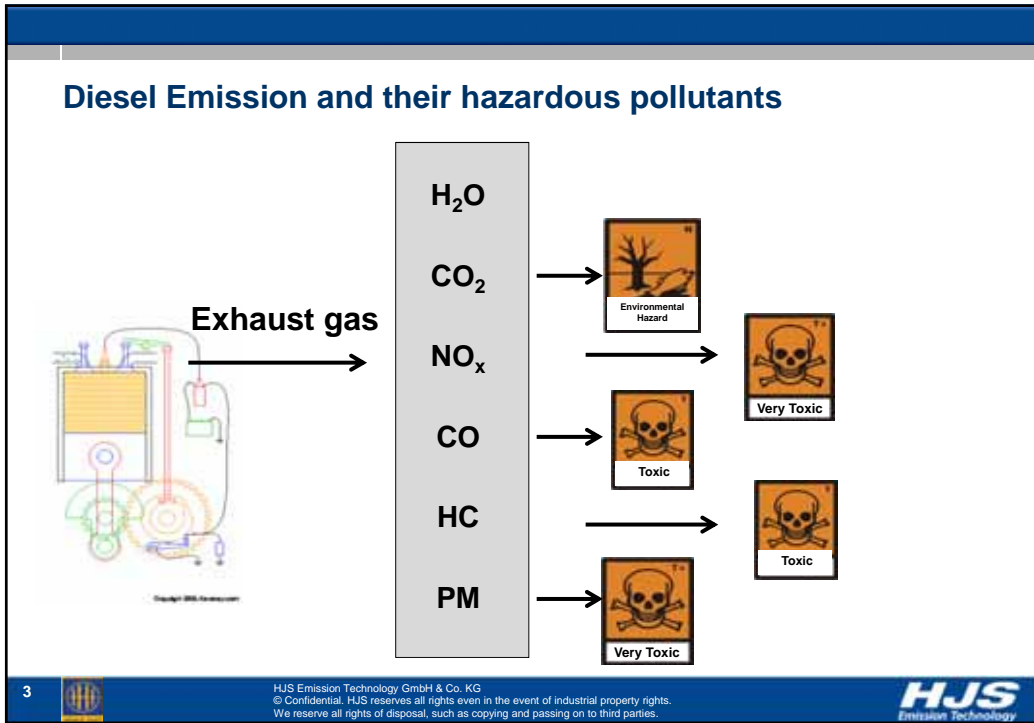
Content

- Diesel engine pollutants
- Particulate reduction technologies and regeneration methods
 - Diesel oxidation catalyst (DOC)
 - Sintered Metal Filter (SMF)
 - Suitable Regeneration methods for underground mining
 - Fuel Borne Catalyst (FBC)
 - SMF-AR
 - Filter cleaning
- NO_x reduction technology
- Combination of Particulate and NO_x reduction technologies



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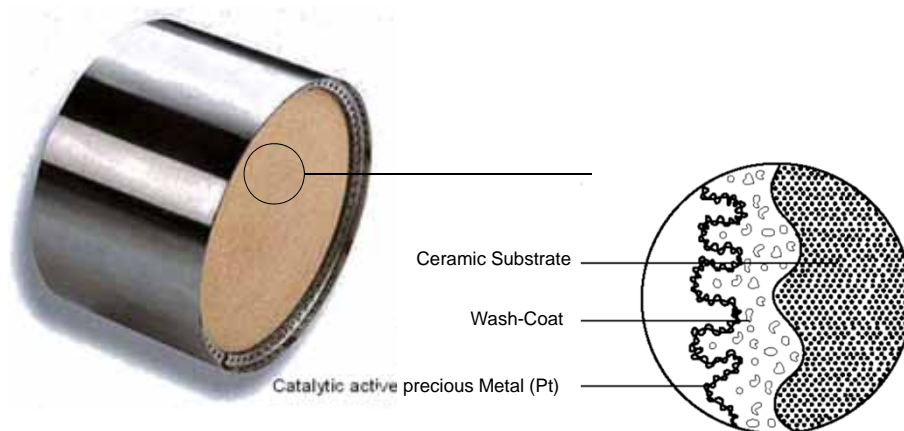
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Diesel-Oxidation-Catalyst (DOC) Design



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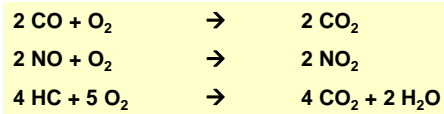
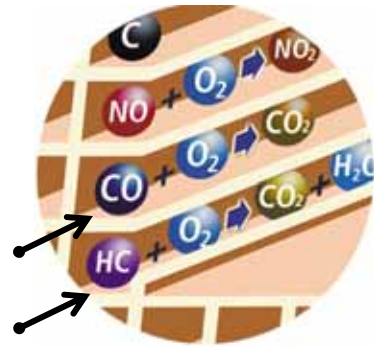
Diesel-Oxidation-Catalyst (DOC)

Transformation of:

- Carbon monoxide (CO) in Carbon dioxide (CO₂)
- Hydro carbon (HC) in Water (H₂O)

Additional functions:

- Transformation of Nitrogen monoxide (NO) in Nitrogen dioxide (NO₂)
- Nitrogen dioxide (NO₂) is needed for the continuously soot oxidation → **CRT principle**



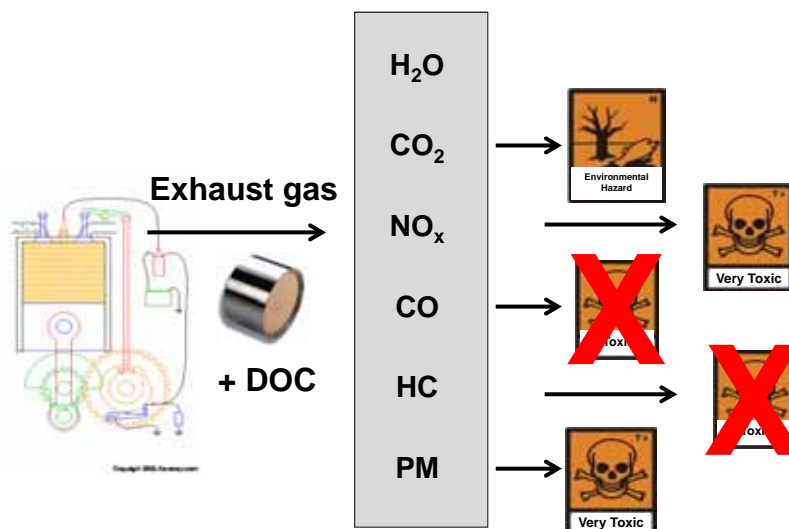
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Diesel Emission and their Hazardous Pollutants

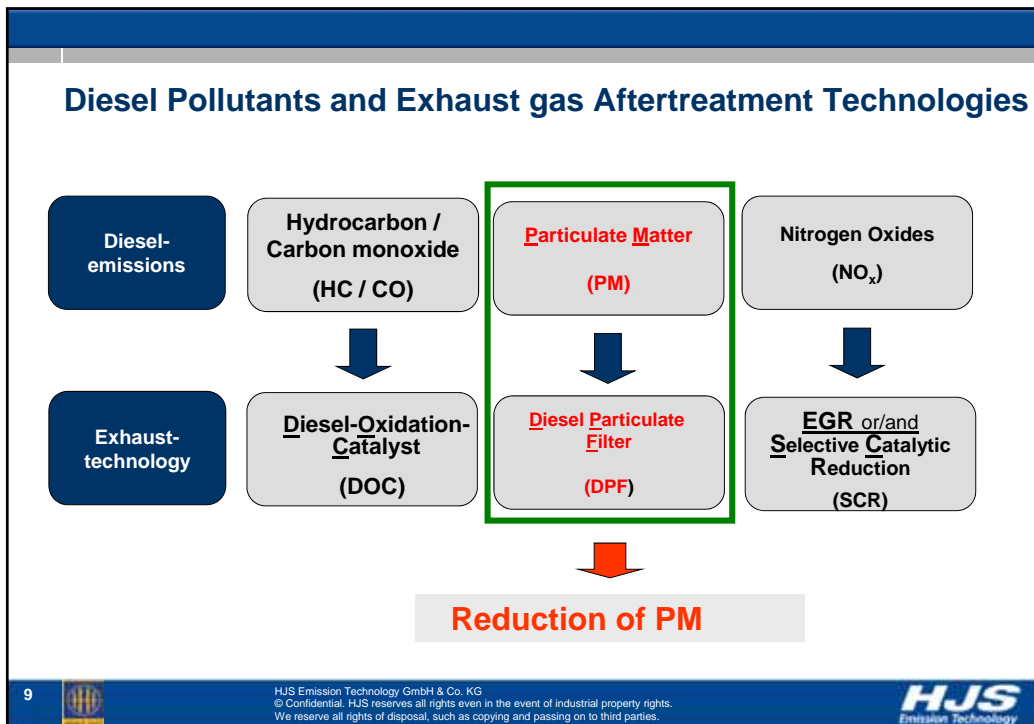


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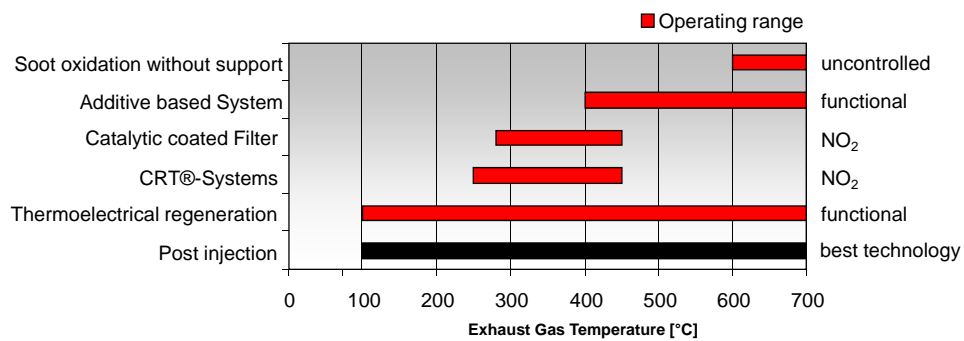
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Application Areas and Soot Regeneration Technologies



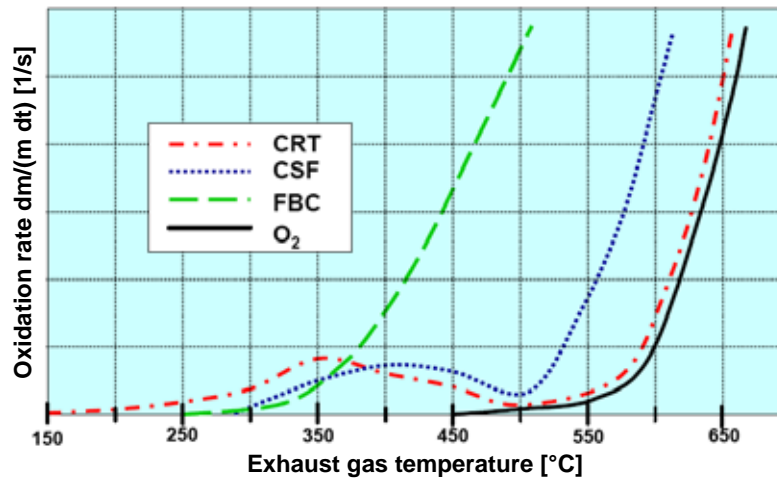
- ⇒ Two technologies which cover the whole temperature range are available
- ⇒ SMF-AR, which is an active regeneration for the lower temperature range
- ⇒ SMF-FBC which is for the higher temperature range



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Exhaust temperature range of different regeneration strategies



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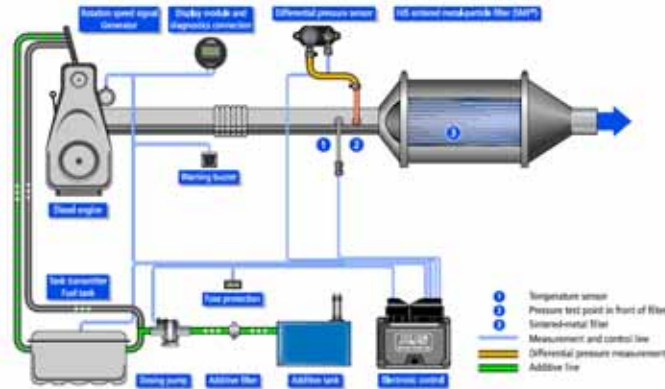
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HJS SMF – FBC (passive NO₂ neutral system)



- In the engine the particulates (soot) will be loaded with the fuel born catalyst (FBC)
- At low exhaust temperatures the additivated soot will be collected in the SMF
- Once the exhaust temperatures raises above 420°C for few minutes the FBC initiates the burning of the collected soot

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Example for successful FBC Application



Application:	Construction equipment
Vehicle:	GHH – LF12
Engine:	Deutz F12
Emission class:	KOM 1
Power:	204 kW
DPF-System:	2 x 8.0m ² SMF - FBC
Dosing:	20ppm Additive
Running time:	approx. 3 years
Info:	The system is running trouble free

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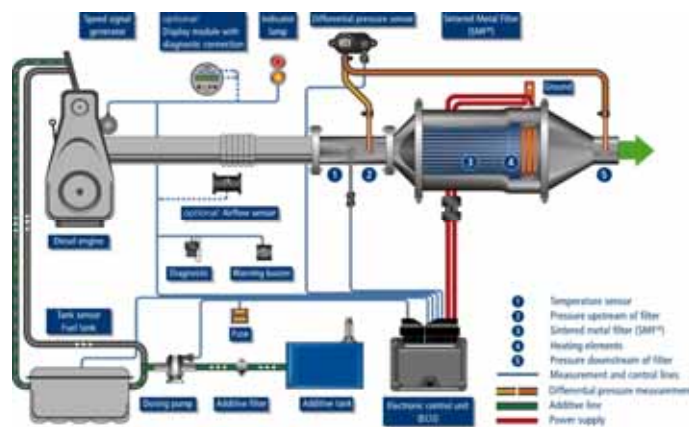
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HJS SMF-AR® (active NO₂ neutral system)



- In the engine the particulates (soot) will be loaded with the fuel born catalyst (FBC)
- At low exhaust temperatures the soot will be collected in the SMF
- Once the filter is soot loaded to a set level it will be ignited by the heating element



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HJS SMF-AR in mine applications



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 **GOLDCORP**

Timmins, Ontario



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Goldcorp unit 230307 pretest

	CO	NO	NOx	NO2	
Idle	88	381	417	37	740 rpm
High Idle	145	397	441	44	2100 rpm
Load	98	548	566	18	1963 rpm

Goldcorp unit 230307 post test

	CO	NO	NOx	NO2	
idle	58	138	153	17	770rpm
High Idle	163	151	179	29	2100rpm
Load	N/A	N/A	N/A	N/A	

46% Reduction of NO2 at idle

65% Reduction of NO2 at high idle

37% Reduction of NOx at idle

66% Reduction of NO2 at high idle

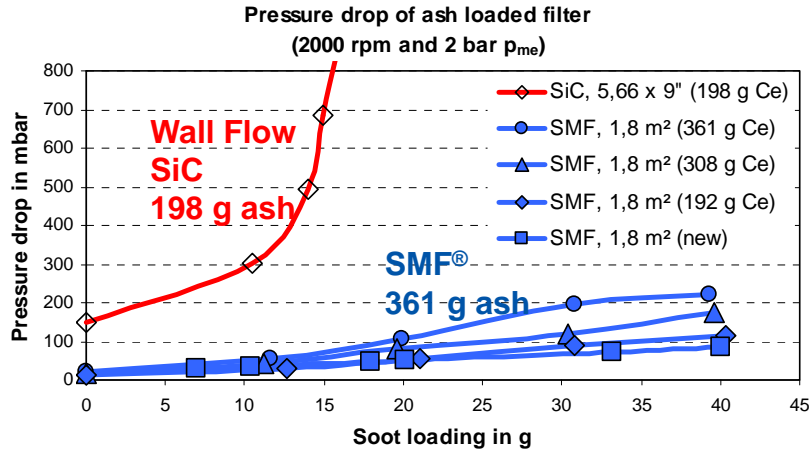


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Application advantages and range of applications



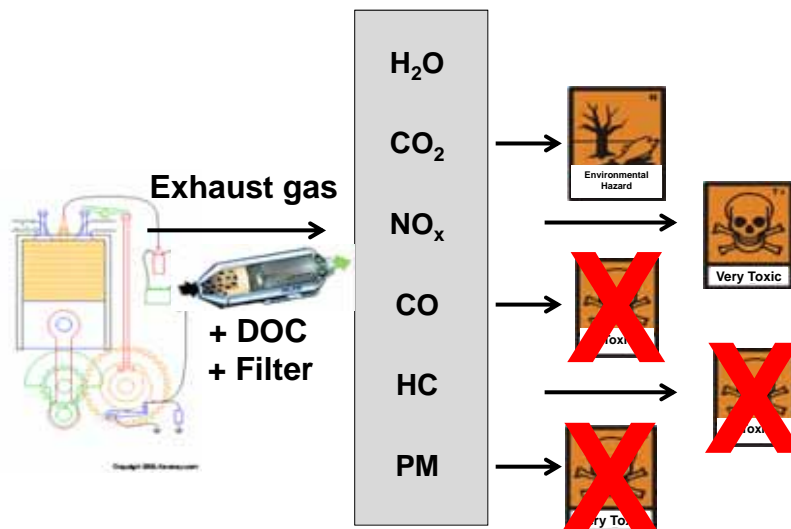
⇒ SMF has a much higher soot loading capacity

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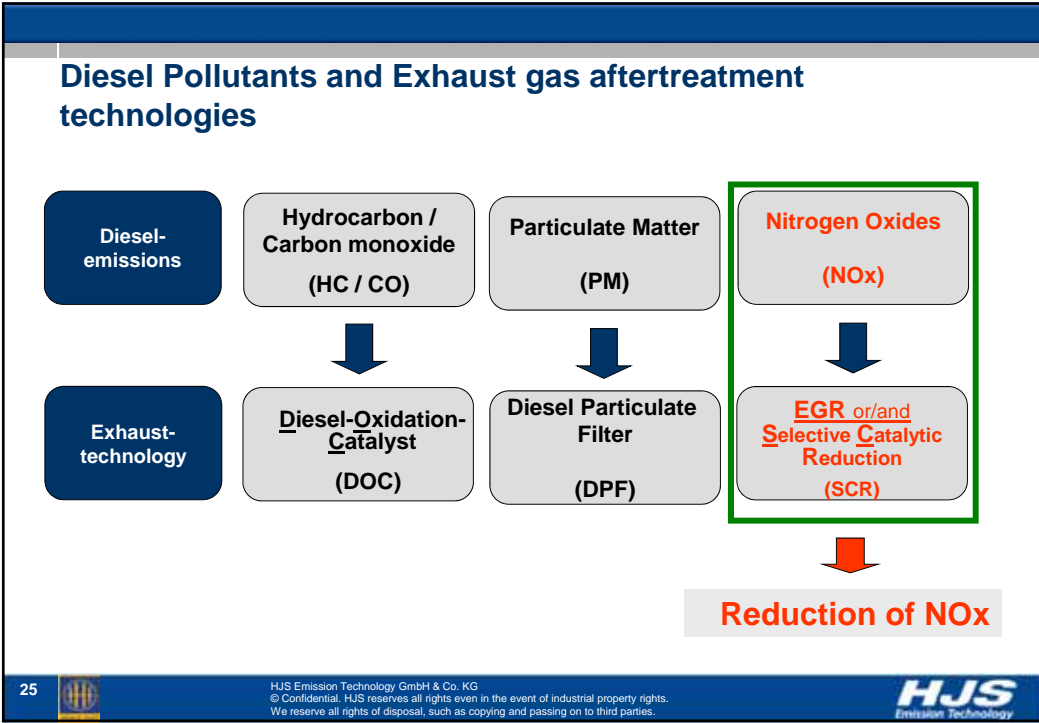
Diesel Emission and their hazardous pollutants



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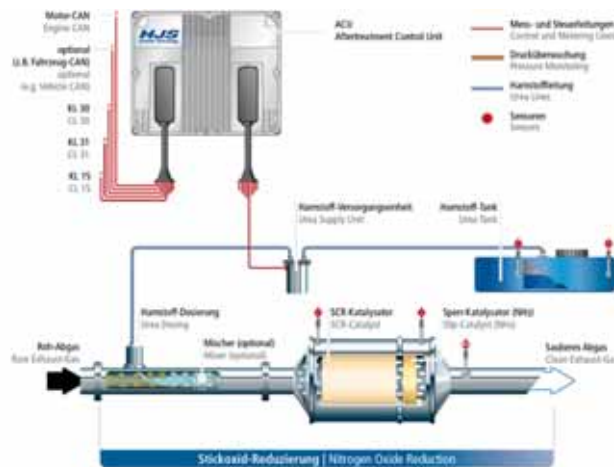


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Selective Catalytic Reduction of NO_x (SCR)



- The SCR system reduces nitrogen oxides (NO_x).
- Urea is added to the exhaust gases.
- This reduction agent is thermally and catalytically converted to ammonia (NH₃).
- The ammonia is then used – in combination with the SCR catalytic converter – to convert the nitrogen oxides (NO_x) into the harmless substances nitrogen (N₂) and water (H₂O) – by up to 90 per cent.

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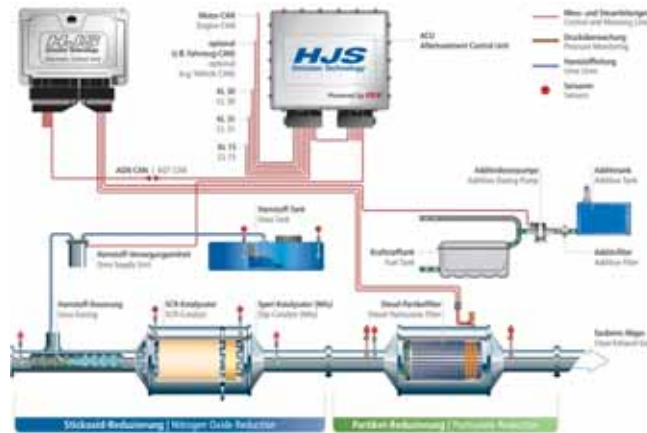
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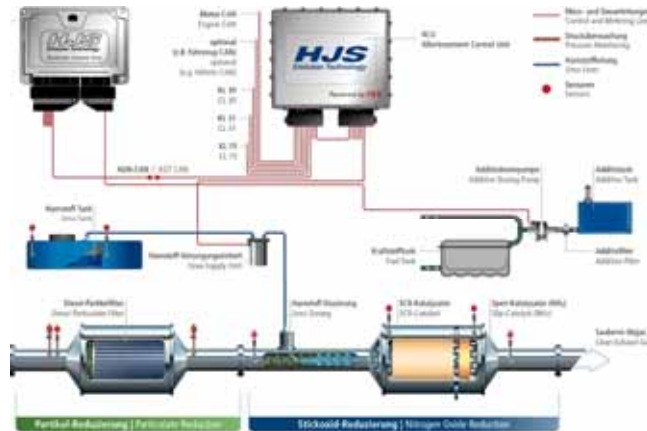
Combination of SCR and SMF-AR



- The SCR system reduces nitrogen oxides (NOx) by 80 - 90%
- SMF-AR reduces soot by 99%



Combination of FBC with SCR



- SMF- FBC reduces soot by 99%
- The SCR system reduces nitrogen oxides (NOx) by 80 - 90%



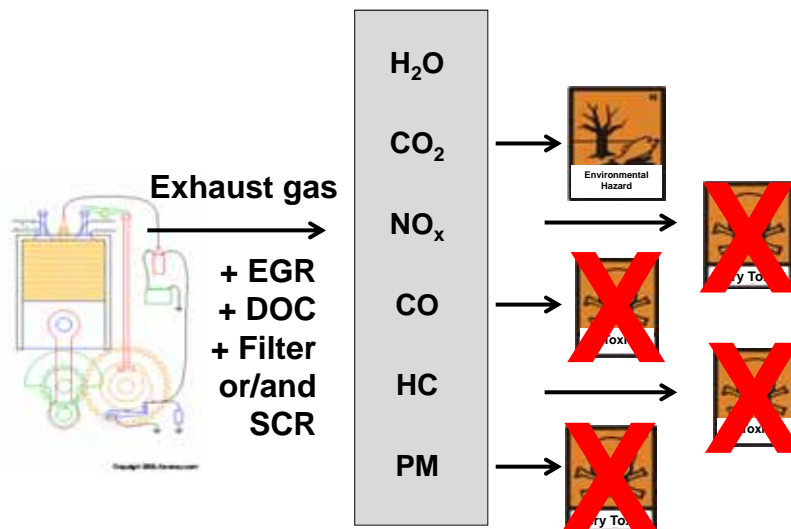
Passive CRT system in combination with SCR (SCRT)



- Soot will be trapped in the Sintered Metal Filter
- Passive regeneration of soot by NO₂
- NO₂ is produced in the upstream installed DOC.
- The SCR system reduces nitrogen oxides (NOx) and excess nitrogen dioxide.



Diesel Emission and their hazardous pollutants



Summary

- Most harmful pollutants of diesel engines are particulates and nitrogen oxides
- Sintered Metal Filters with 99 % soot reduction efficiency and easy cleaning fulfills the technical request for underground mining
- Depending on exhaust gas temperature passive or active regeneration method based on fuel additive can be chosen. No NO₂ formation and in some cases a reduction of NO₂.
- Reduction of nitrogen oxides (incl. NO₂) by SCR technology
- Combination of nitrogen and particulate reduction are state of the art technologies

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Vielen Dank

Thank You



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October 2010